
What's the Difference Between Experiment and Simulation?

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Abstract

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Experiments in biology are often considered to be epistemically superior to simulations. While some have suggested that computer simulations are a kind of experiment (e.g., Peck 2004, Parker 2008), others have argued that there are significant methodological and epistemic differences between the two (e.g., Winsberg 2008, Morgan 2003, Guala 2005). A common theme in accounts of these differences is the idea that experiments *replicate* (aspects of) their targets in the world, while simulations *represent* or *mimic* them.

I argue that these category distinctions focus us on the wrong issues. The relationship between one's direct object of study and ultimate target of inquiry matters. But this relationship does not characterize a clear distinction between experimenting and simulating, either in kind or in epistemic implications. To develop this point, I focus on recent examples of studies of speciation, using both computer simulations and experimental evolution of microbial populations. This case lends support to a general conclusion: Whether we are better off studying a phenomenon in the world by interacting with experimental systems or computer simulations depends on a complex of factors-including the kind of question we are asking and what we are asking it about-and not on some absolute assessment of the primacy of one kind of scientific inquiry over another.

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